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## *Ligularia philanthrax* (Asteraceae), a new species from a coal mining region of Kyrgyzstan

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*Ligularia philanthrax* Lazkov & Sennikov *sp. nova* (Asteraceae) is a new species from Kyrgyzstan, narrowly distributed in the Turkestan Mountain Range. It differs from the most similar species, *L. pavlovii* (Syrdarya Karatau Mts., Kazakhstan) by having fewer scales at its stem base, oblong-obovate basal and lower cauline leaves with narrow herbaceous sheaths, and by having more numerous longer ligulate flowers. *Ligularia philanthrax* occurs in the Sülüktü coal mining region and is considered Critically Endangered because of its restricted distribution, anthropogenic impact and a high level of grazing.

*Ligularia* (Asteraceae) is a moderately species-rich genus in the tribe Senecioneae, subtribe Tus-silaginatae (Pelser *et al.* 2007, Nordenstam *et al.* 2009), whose estimated species number varies from 140 (Liu & Illarionova 2011) to over 150 (Pojarkova 1961). The maximal country-level species diversity of the genus occurs in China, with 123 species (89 endemic; Liu & Illarionova 2011). The arid mountains of Central Asia are not particularly suitable for this genus; only 17 species were recorded in this vast territory, with the greatest diversity in the most humid mountains of northeastern Kazakhstan (Pojarkova 1961, Zuckerwanik 1993).

Only few of the Central Asian species of *Ligularia* are narrow endemics. Among these, *L. pavlovii* (Lipschitz 1931) is confined to the Syrdarya Qarataý (Syrdarya Karatau) Mts., a

relatively small mountain range in the north-western part of the Western Tian-Shan that harbours many plant endemics. Kamelin (1990) estimated the number of endemic species and subspecies in this territory at 150. *Ligularia pavlovii* was placed in a monotypic section, *L. sect. Glossophyllum* because of its unique feature: the presence of scale-like reduced leaves at the stem base (Pojarkova 1961). So far, this character has not been known from any other member of the genus.

During a recent inventory of vascular plants of the Turkestan Range in Kyrgyzstan (Ganybaeva 2009), an unusual plant of *Ligularia* was collected. This plant had some scale-like reduced leaves at the stem base but immediately differed from *L. pavlovii* by their number and texture, and also by the basal leaf shape and in the number



Fig. 1. Flowering heads of *Ligularia philanthrax*.

of ligulate flowers in capitula (Table 1). These characters provided a firm evidence that we are dealing with another local endemic of *Ligularia*, which is formally described here.

Vascular plants of the watershed of the Isfana and Laylak rivers (Turkestan Range) were studied by M.R. Ganybaeva in 2009, supervised by the first author. Herbarium collections were identified and deposited in FRU. The locality of the new species was revisited in 2019 to observe the population.

Taxonomic literature (Pojarkova 1961, Zuckerman 1993, Liu & Illarionova 2011) was examined to determine the relationships of the new species. The species description largely follows Pojarkova (1961) and Liu and Illarionova (2011). A distribution map was made using the same procedure as in Lazkov and Sennikov (2017).

Toponyms and personal names in the Kazakh and Kyrgyz languages were transliterated according to the national Latin scripts. The spelling of toponyms in Kyrgyzstan follows Ömürzakov *et al.* (1988). Romanization of taxonomic authors' names follows original publications, as advised in Rec. 46B.1 of Turland *et al.* (2018).

***Ligularia philanthrax* Lazkov & Sennikov, sp. nova (L. sect. *Glossophyllum*) (Figs. 1 and 2)**

TYPE: Kyrgyzstan. Turkestan Range (N side): NE of Vostochny Village, 5–7 km E of Shyrykty Pass, juniper thickets on rocks, 19 April 2019 *G.A. Lazkov* (holotype LE, isotypes FRU, MW). — PARATYPE: Same locality, 9 May 2007 *M.R. Ganybaeva* (FRU).

ETYMOLOGY: The species name is derived from Ancient Greek *φίλος* (*philos*, “beloved”) and *ἀνθραξ* (*ánthrax*, “charcoal”).

*Species nova a Ligularia pavlovii squamis rosulatis paucioribus herbaceis (nec membranaceis), foliis basalibus oblongo-obovatis (nec oblongo-ellipticis) et ligulis pluribus (12–15, nec ca. 8) longioribus (12–14 mm, nec ca. 7 mm longis) differt.*

Rhizome short, with numerous thin roots and fibrous remains of old petioles, branched. Plants greyish-green, arachnoid-puberulent. Stems erect, 1–4, 25–40 cm tall, ca. 0.3 cm in diam. at base, striate. Sterile rosettes few to several, usually adjacent to flowering stems, with a few scales and developed leaves. Outer leaves of sterile rosettes reduced to sheaths; sheaths narrow, herbaceous. Inner leaves of sterile rosettes developed, petiolate; petiole shorter than lamina, unwinged or upper winged, base herbaceous, sheath narrow; lamina oblong-obovate, 6–14 cm long, 1.5–3.5 cm wide, with a midvein expressed below, entire, apex rotund to obtuse, base gradually attenuate. Basal leaves of fertile stems completely reduced to sheaths, surrounded with abundant fibrous remains of old petioles. Cauline leaves (under synflorescence) 2–4; lower ones shortly petiolate, with herbaceous sheaths, oblong-obovate; others sessile, oblong to oblanceolate, shorter than internodes,

**Table 1.** Diagnostic characters of *Ligularia pavlovii* and *L. philanthrax*. Data on *L. pavlovii* from Pojarkova (1961).

Characters	<i>L. pavlovii</i>	<i>L. philanthrax</i>
Reduced basal leaves	numerous	few
Lamina of developed basal leaves	oblong-elliptic, apex usually cuneate	oblong-obovate, apex usually subrotund
Sheaths of developed basal leaves	inflated, membranaceous	narrow, herbaceous
Remnants of old petioles	meagre	abundant
Ligulate flowers	ca. 8, elliptic, ca. 7 mm long	12–15, linear, 12–14 mm long



**Fig. 2.** Plants of the type specimen of *Ligularia philanthrax*.

subacute, auriculate to amplexicaul. Synflorescence subcorymbose, very lax, branches 1–8 cm long. Capitula 2–4, supplementary bracts 1–2, linear. Involucre turbinate, in 2 rows. Phyllaries 10–12, 10–12 mm long, outer ones oblong, with a wide membraneous margin, inner ones lanceolate, with a narrow margin, all attenuate or caudate at apex. Ray florets 12–15, yellow; lamina 12–14 mm long, 2.5–3 mm wide. Tubular florets numerous, 10–11 mm long, narrowly campanulate, tube ca. 5 mm long, lobes ca. 1 mm

long. Achenes (unripe) cylindric, 6–12 mm long, ribbed, glabrous. Pappus 10–11 mm long, scabrous, white. Flowering in May.

**DISTRIBUTION AND HABITAT.** Pamir-Alay: Turkestan Range (northern side). Endemic to Kyrgyzstan (Fig. 3). Growing among juniper thickets on carbonatic rocks, at 1700–1800 m a.s.l.

**CONSERVATION STATUS.** The species is known from a restricted territory ca. 5 km wide, whose extent is estimated at 8–10 km<sup>2</sup>. The species' population is estimated to include 2000 mature



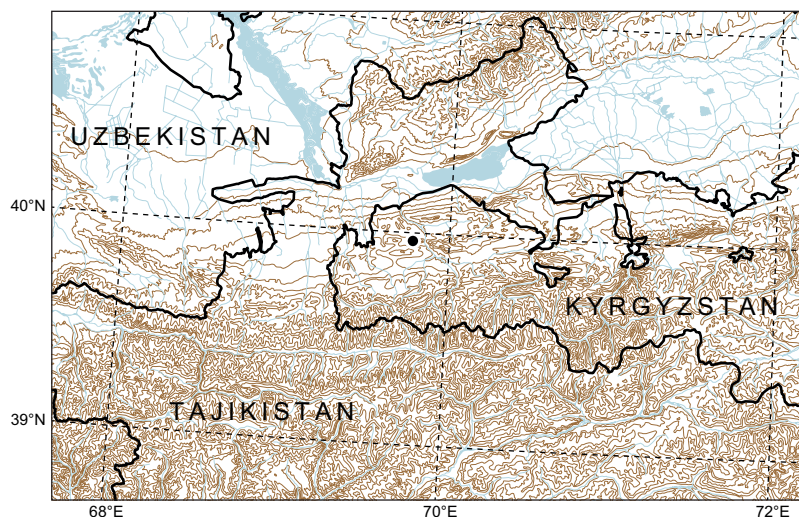


Fig. 3. Distribution of *Ligularia philanthrax*.

individuals. The population seems to be healthy and many individuals were observed in flower, although cattle damage was also visible. The population is situated within a coal mining area at Sülüktü, which is among the largest and most intensely exploited coal fields in the country, and therefore is under apparent risk of extinction. The species is therefore assessed as Critically Endangered (CR) according to the criteria B2ab(i) (IUCN 2012). Its distribution lies outside protected areas.

According to the taxonomic system of Pojarkova (1961), *L. philanthrax* is tentatively classified in *L. sect. Glossophyllum* because of the presence of reduced scale-like basal leaves. As evident from other characters of flowering heads and the plant habit, this species and its presumably close relative *L. pavlovii* are also very similar and probably related to the species of *L. sect. Senecillis*, as compared by Pojarkova (1961). So far, a sufficient phylogenetic study of *Ligularia* is lacking, and the available phylogenies (Liu *et al.* 2005, Pelter *et al.* 2007) do not provide any insight into species relationships within the genus.

Reduced scale-like basal leaves of *L. philanthrax* and *L. pavlovii*, which persist within a season and do not wither early like smaller-size outermost rosette leaves, seem to function as cataphylls that are acting as bud scales. In these species, developed basal leaves at the base of flowering stems are lacking. Developed basal leaves that look like belonging to flowering

stems are formed in axils of reduced scale-like leaves and actually belong to the first-year growth of dicyclic shoots that will produce a flowering stem but no developed basal leaves during the second year.

In species of *L. sect. Senecillis*, rosette bud scales are lacking and outermost rosette leaves are not reduced to sheaths. This difference in shoot structure is very similar to that observed in *Ranunculus cassubicus* and *R. auricomus* (Serebryakov 1952). Since its taxonomic value in *Ranunculus* is undoubtedly infrasectional (Tzvelev 2001), the placement of *L. philanthrax* and *L. pavlovii* into a separate section seems to be unjustified and their relocation to *L. sect. Senecillis* is suggested.

The large disjunction between distribution areas of *L. philanthrax* and *L. pavlovii* is not very surprising. The number of isolated taxa at different ranks in Central Asia is quite high, making this territory a hotspot of diversity of flowering plants (Mittermeier *et al.* 2011). Recent phylogenies (e.g. Kilian *et al.* 2017) continue uncovering ancient lineages in this territory. Another example of disjunct distributions between the Syrdaria Qarataý in the Western Tian-Shan and the Pamir-Alay Mountain System in an isolated plant group can be seen in the genus *Autumnalia* (Apiaceae). So far, that genus has two representatives (Pimenov 1989), both being narrow endemics in two remote territories: one in the Syrdaria Qarataý, the other in the Nurota Mts.

(the westernmost part of the Hissar-Alay that also includes the Turkestan Range).

With *L. philanthrax*, there are 18 species of the genus in Central Asia, of which four are narrow endemics. This discovery brings further evidence that the inventory of Central Asian flora is far from completion, and its newly recorded species may be critically endangered because of very intensive grazing and extensive mining in this territory.

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